

STAFF STUDY -- SIMULATED IMAGERY PROGRAM

1. PROBLEM

To develop artificial imagery containing known distortions and known geometric characteristics to be used for testing NPIC developed equipment.

2. FACTS BEARING ON THE PROBLEM

a. Sophisticated and complex equipment designed for auto correlation, stereo tracking, anamorphic correction, etc. has been developed or is now under development by NPIC.

b. These items represent a total projected development cost of approximately [REDACTED] To insure that these equipments are properly performing their required functions, operational-type imagery is required for test purposes at the various Contractor facilities, and for NPIC Engineering Support Division during final evaluation.

c. Imagery suitable for utilization as realistic test material is normally highly classified, due either to its content or to the acquisition system parameters, which might possibly be reconstructed from the materials. Imagery is seldom available in which the operational and geometric distortion characteristics are completely known. Since ground truth is missing, it often cannot be determined whether the imagery or the equipment being tested is in error.

d. Many Contractors have neither the clearances nor the facilities for storing or handling highly classified material.

e. Computerized techniques may be utilized for simulating complex geometrical situations, where it is not possible or desirable to use the true conditions.

3. DISCUSSION

a. Current Procedures - There presently is no unclassified panoramic strip or strip oblique photography, with all the operational parameters and geometric distortion characteristics known which can be used at Contractor sites to check out instruments or programs under development. Verbal reports

Declass Review by NIMA/DOD

and written data have been used in the past, but this method of solving the problem has never been completely satisfactory and is becoming even more unsuitable as the equipments become more intricate and precise.

b. Origin of Concept - The unsuitability of current procedures has been highlighted during the progress of a number of recent NPIC development programs. As test plans have been developed, there is an increasing awareness that the operational efficiency of instruments designed to reduce the distortions peculiar to certain aerial imagery cannot be thoroughly tested, either at the fabrication sites or at NPIC after installation. Not only does the classification of operational material prevent convenient handling, both in transit and at the Contractor's site, but also our knowledge of the actual acquisition parameters is not sufficiently explicit to permit accurate testing at NPIC, i.e., ground truth is not available.

c. Proposed Program - It is envisioned that under the proposed project, high precision sample grids will be prepared which have been distorted to appear in the form of operational imagery on pitched pan and strip format. A computer program math model would be constructed which is capable of accepting various changes in such parameters as focal length, altitude, sweep rate, IMC, air speed, film speed, etc. This would produce a graphic printout of a grid pattern which would simulate the appearance of an undistorted grid on the ground, but now distorted as if it had been captured on actual imagery under the specified conditions. This material would then be plotted in actual operational formats and lengths. It would also be possible, once the basic program is written, to produce sets of images with only certain of the variables displayed on each piece of material, in order to avoid any analytical difficulties arising from the simulation of all of the distortion parameters on a single piece of material. Photographic reproductions would then be made of these master printouts for use on an unclassified, or low level classification basis at the Contractors' facilities as well as within NPIC.

d. Selection of Contractor - Because of the sensitive nature of the material being simulated, and in order to expedite the proposed program, only bids from Contractors having the necessary clearances will be solicited. Ideally, the work will be performed by software people already familiar with acquisition systems but not limited to any one company's product. If we were to take one obvious approach and deal with the acquisition system manufacturers themselves, more than one contract might be necessary to obtain full coverage of all of the systems.

e. Coordination - The nature of the proposed task is such that it is highly improbable that duplication would exist within the community. DDS&T will be advised of the proposed activity, however, as well as OCS/CIA and DIA. Internally close liaison with AID will be maintained.

f. Alternatives - The alternative at this point essentially is whether the proposed program should or should not be undertaken. In the first case, a valuable adjunct to the NPIC test capability would be derived which would permit the newer, more complex equipments to be tested and debugged. It would supply a testing means, with changeable inputs, which would permit an assessment to be made of the ability of new and untried systems to cope with varying real-world conditions. If the program is not undertaken, it will be difficult if not impossible to verify the outputs of some of the features which are currently being designed into the newer equipments, and it will be necessary to continue the remaining testing procedures which are becoming more archaic as the equipments to be tested become increasingly more sophisticated.

4. CONCLUSIONS

Present NPIC methods for checking and testing certain film distortion corrections are outmoded. With the arrival at NPIC of equipment now under development, such as the High Precision Stereo Comparator, the NPIC testing capability will be exceeded and will be useless in certain areas. In order to completely test these new equipments, and to permit periodic checks, tests, and verification of these and other systems, imagery of precisely known parameters is required. The proposed project will yield this necessary material through simulation rather than collection. Considering the total development cost of equipment currently nearing the test and evaluation stage, this appears to be a small and rather essential investment to insure that we are, in fact, getting what we paid for.

SECRET

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R & D CATALOG FORM

DATE
27 February 1969

1. PROJECT TITLE/CODE NAME
SIMULATED IMAGERY

2. SHORT PROJECT DESCRIPTION
To develop artificial imagery containing known distortions and known geometric characteristics to be used for testing NPIC developed equipment.

3. [Redacted]

5. CLASS OF CONTRACTOR
Manufacturer

6. TYPE OF CONTRACT
Fixed Price

7. FUNDS
FY 19 \$

8. REQUISITION NO.

9. BUDGET PROJECT NO.
NP-0-7

FY 19 69 [Redacted]

10. EFFECTIVE CONTRACT DATE
(Begin - end)
31 March 1969 - 31 July 1969

11. SECURITY CLASS.
A.A. - Confidential
T. - Unclassified
W. - Top Secret

12. RESPONSIBLE DIRECTORATE/OFFICE/PROJECT OFFICER TELEPHONE EXTENSION

DDI/NPIC/TSSG/DED/[Redacted]

13. REQUIREMENT/AUTHORITY
TSSG/DED requires unclassified imagery, with the same distortion as operational imagery, to use at various contractor facilities to test equipment under development.

14. TYPE OF WORK TO BE DONE
Prepare a computer program for the UNIVAC 494 that will provide the capability for making a graphic plot to serve as simulated imagery of operational material.

15. CATEGORIES OF EFFORT

MAJOR CATEGORY	SUB-CATEGORIES
Other	Precision Measurement Support
	Information Handling Support

16. END ITEM OR SERVICES FROM THIS CONTRACT/IMPROVEMENT OVER CURRENT SYSTEM, EQUIPMENT, ETC.
The end item will be artificial imagery with the known distortions and geometric characteristics of operational imagery. This will be used to insure that exploitation equipment is properly performing its function.

17. SUPPORTING OR RELATED CONTRACTS (Agency & Other)/COORDINATION
There are no supporting or related contracts. Coordination has been effected within the Agency and within the intelligence community through COMIREX.

18. DESCRIPTION OF INTELLIGENCE REQUIREMENT AND DETAILED TECHNICAL DESCRIPTION OF PROJECT (Continue on additional page if required)
This project is for the development of a computer program suitable for the UNIVAC 494 computer. This computer program will produce a graphic plot of unclassified artificial imagery in the operational film formats. This unclassified imagery can be used at various contractors' facilities to test and accept certain auto-correlation, automatic stereo tracking, etc. features of equipment under development.

19. APPROVED BY AND DATE

OFFICE DEPUTY DIRECTOR DDCI

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